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(54) I.C engine fuel injector outlets

(57) Four cylindrical apertures 18 are defined in a metal or plastics cap 15 downstream of the injector outlet 6.

Fig. 1

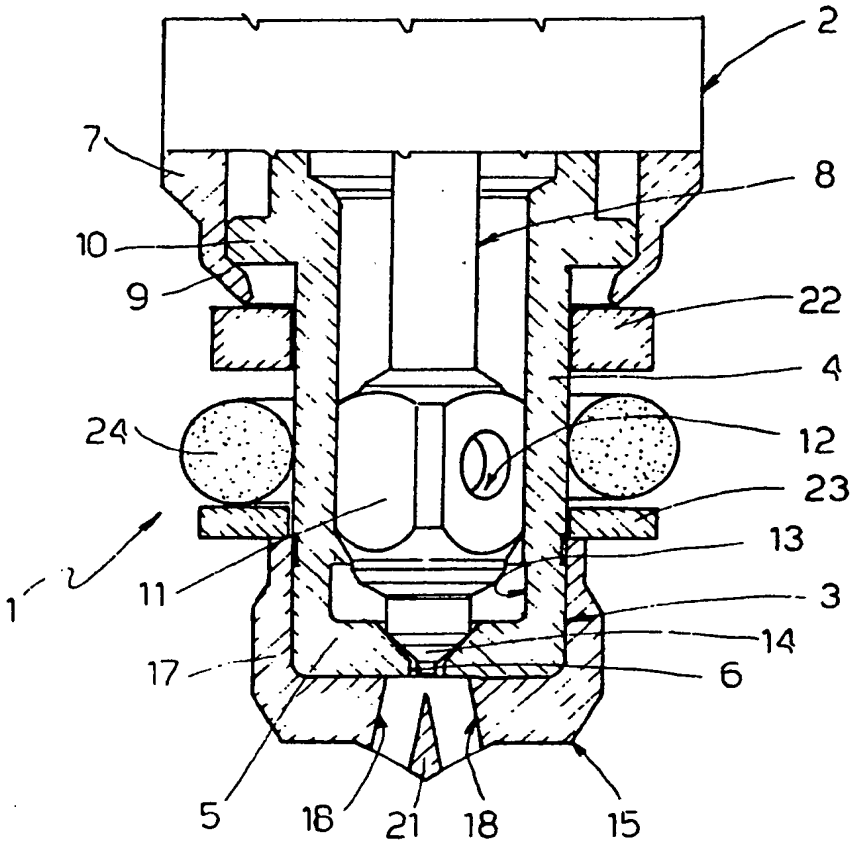

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Fig.1

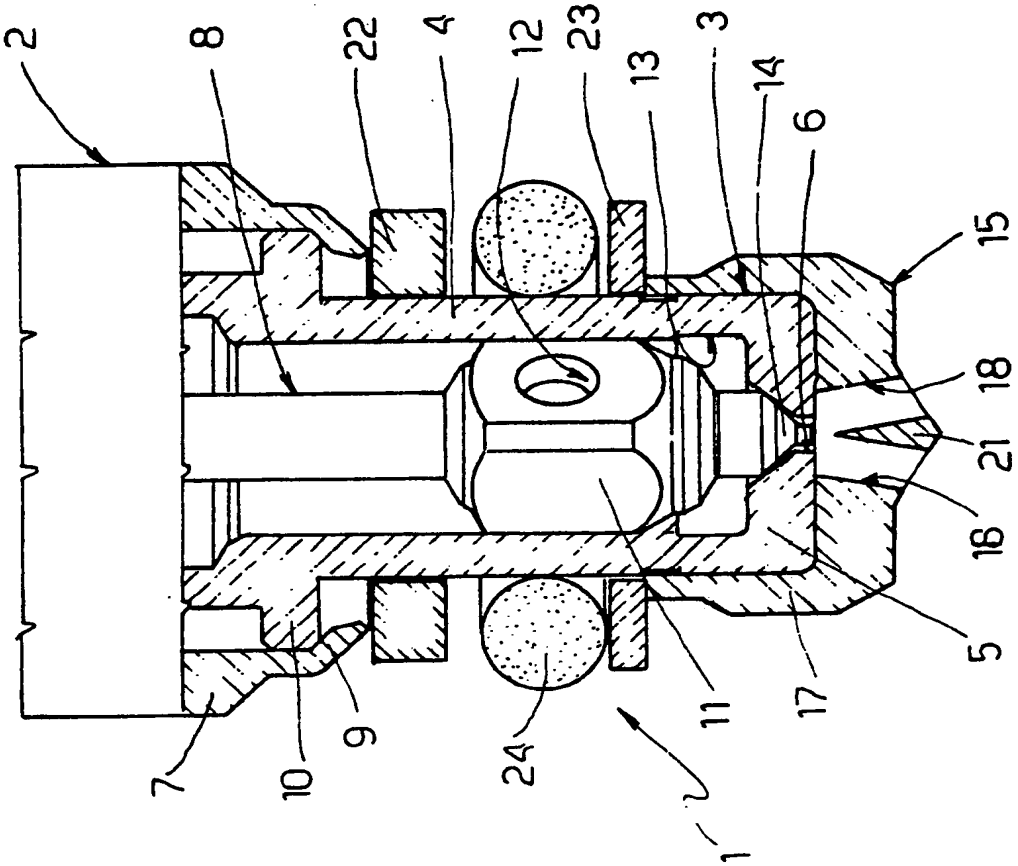
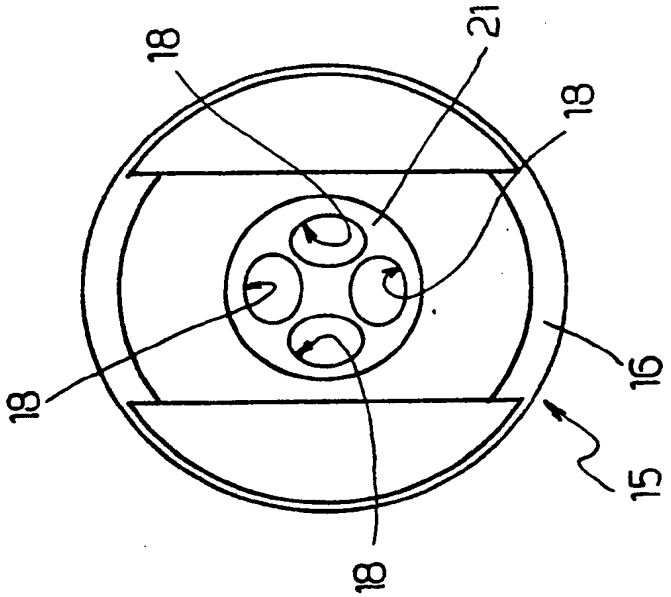


Fig.2



A FUEL METERING AND ATOMISATION VALVE FOR AN INTERNAL COMBUSTION ENGINE FUEL INJECTION SYSTEM, WITH A FLOW DIVIDER OF IMPROVED TYPE

The present invention relates to a valve for metering and atomisation of the fuel in an internal combustion engine fuel injection system, with a flow divider of improved type.

As is known, valves of the type indicated above comprise a nozzle having an injection hole, and downstream from this, a flow divider adapted to divide the fuel jet. It is known, moreover, that the greater the atomisation of the fuel the better is the mixture between the air and fuel and therefore the better the combustion of this mixture.

Flow dividers installed in current valves have for this purpose two inclined apertures which, however, separate the fuel jet into two relatively compact streams and therefore the division of the fuel is poor. Moreover, the apertures in the divider are of small diameter and therefore constitute a restriction to the flow of fuel the flow rate of which is, as is known, defined by the diameter of the injection hole. Finally, in current flow dividers, it is necessary to form reference points so that during assembly orientation of the position of

the two holes of the divider with respect to the induction manifold of the engine can be achieved.

The object of the present invention is that of providing a valve of the type above indicated which will be free from the above-mentioned disadvantages and which therefore will provide a flow divider which allows a more effective atomisation of the fuel and which can be assembled simply and rapidly.

According to the present invention there is provided a valve for metering and atomisation of the fuel in an internal combustion engine fuel injection system, of the type comprising a nozzle (3) having an injection hole, characterised by the fact that downstream from the said injection hole there is installed a divider adapted to divide the fuel jet, for which purpose it includes four apertures the respective longitudinal axes of which are inclined with respect to the longitudinal axis of the said divider.

For a better understanding of the present invention a preferred embodiment will now be described purely by way of non-limitative example, with reference to the attached drawings, in which:

Figure 1 is a section through a valve formed according to the principles of the present invention;

and

Figure 2 is a view from below looking upwards of a component of the valve of Figure 1.

With reference to Figure 1, the reference numeral 1 generally indicates a fuel metering and atomisation valve for an internal combustion engine fuel injection system 2 (illustrated partially because it is of known type) the valve 1 comprises a substantially tubular nozzle 3 having a cylindrical side wall 4 and a lower wall 5 in which is formed an injection hole 6. The device 2 includes a body 7 which at its lower end supports a nozzle 3 which has an axial bore along which a shutter member 8 is axially slidable. A lower edge 9 of the body 7 is, in use, folded inwardly to engage over an annular flange 10 extending from the side wall 4 of the nozzle 3.

It is known that preferably the fuel flows through an axial passage formed in the shutter member 8 as far as its faceted portion 11, from which it flows through radial holes 12 into the interior of a chamber 13 defined within the nozzle 3. It is likewise known that the shutter member 8 is translated upwardly, against the action of spring means, by the attraction which is exerted by a ferromagnetic core excited by an appropriate electric coil on an armature fixed to the

shutter member 8. This includes a substantially tapered lower end 14 which in use acts on the interior of the injection hole for partial or total obstruction thereof.

With reference to Figures 1 and 2, according to the present invention the valve is provided with a divider 15 constituted by a cup-shaped cylindrical body having a lower wall 16 and a cylindrical side wall 17. The divider 15, in use, is fitted over the nozzle 3 and in particular coaxially receives a lower portion of the nozzle 3. The inner face of the wall 16 of the divider 15 is in contact with the outer face of the wall 5 of the nozzle 3. In this wall 16 of the divider 15 there are formed four substantially cylindrical apertures 18.

The apertures 18 have respective longitudinal axes inclined with respect to that of the divider 15 and in particular in section are informally distributed with respect to the longitudinal axis of the divider 15. The apertures 18 have respective inlet openings (formed on the inner face of the wall 16) which open in to one another and in particular present a common zone, exactly in correspondence with outlet opening of the injection hole 6. The outlet openings of the apertures 18 are in the side wall of a substantially conical projection 21 extending coaxially from the outer face of the wall 16.

The divider 15 can be made in metal or in moulded plastics material. In a metal divider 15 the apertures 18 can be made by punching, by electro-erosion or by laser technology.

Around the nozzle 3, between an upper washer 22 fitted on the side wall 4 and a lower washer 23 which contacts the upper edge of the side wall 17 of the divider 15, there is formed a seat for an annular seal 24.

In use, the jet of fuel which is ejected from the injection hole 6 is separated into four parts by the divider 15. Moreover, it is to be noted that because of the shape of the four apertures 18 the central part of the wall 16 which separates them is exactly in correspondence with the openings of the apertures 18. This eliminates the phenomenon of bounce of the central region of the fuel jet as happens in current dividers.

From what has been explained above the advantages consequent on the present invention are apparent.

In particular, the valve is provided with a divider in which there are formed four apertures and therefore which is adapted to cause a more effective division and thus atomisation of the fuel jet. This contributes to an improvement in the degree of mixing of the fuel with

the air and therefore improves the combustion of the mixture. Moreover, the apertures 18 have a great overall width and therefore they do not constitute a restriction limiting the rate of flow of the fuel. It is to be noted that by forming the apertures 18 in an uniformly distributed manner it is no longer necessary to form reference points for orientation of these with respect to the fuel induction manifold of the engine. This considerably facilitates the assembly of the device 2 and its mounting for which the single reference point is constituted by an electrical supply connector for the coil. Further, it is to be indicated that the divider 15 is of simple construction and therefore of low production costs.

Finally, it is clear that the valve 1 described and illustrated here can have modifications and variations introduced thereto without by this departing from the protective ambit of the present invention.

CLAIMS

1. A valve for metering and atomisation of the fuel in an internal combustion engine fuel injection device , of the type comprising a nozzle in which is formed an injection hole , characterised by the fact that downstream from the said injection hole there is installed a divider adapted to divide the fuel jet and having four apertures the respective longitudinal axes of which are inclined with respect to the longitudinal axis of the said divider .

2. A valve according to Claim 1, characterised by the fact that the inlet openings of the said apertures open into one another and lie on an internal face of the said divider facing the said injection hole .

3. A valve according to Claim 2, characterised by the fact that the inlet openings of the said apertures have a common region thereof in correspondence with the outlet opening of the said injection hole .

4. A valve according to Claim 3, characterised by the fact that the said apertures are uniformly distributed with respect to the longitudinal axis of the said divider .

5. A valve according to Claim 4, characterised by the fact that the said apertures are cylindrical.

6. A valve according to any one of the preceding claims, characterised by the fact that the said nozzle has a tubular form and comprises a cylindrical side wall and a lower wall in which the said injection hole is formed; the said divider having a cup-shape cylindrical body adapted coaxially to house the lower portion of the said nozzle .

7. A valve according to Claim 6, characterised by the fact that the said divider has a cylindrical side wall and a lower wall in which the said apertures are formed, and the internal face of which is substantially in contact with the outer face of the said lower wall of the said nozzle .

8. A valve according to Claim 7, characterised by the fact that the outlet openings of the said apertures lie on a side wall of a substantially conical projection extending coaxially from the outer face of the said lower wall of the said divider .

9. A valve according to any preceding claim, characterised by the fact that the said divider is made of metal and the said apertures are made by

punching, electro-erosion or laser technology.

10. A valve according to any of claims from 1 to 8, characterised by the fact that the said divider is made of moulded plastics material.

11. A valve for metering and atomisation of the fuel for an internal combustion engine fuel injection device, substantially as described and illustrated with reference to the attached drawings.